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# Thermal quench of open field plasma intercepting with recycling walls

- When a fusion plasma suddenly intercepts a solid surface (wall or pellet), thermal collapse is distinctly kinetic & has novel physics
- VPIC simulations & theory revealed the fascinating dynamics of four propagating fronts controlling parallel electron temperature cooling

- Two electron fronts with speed of  $\sim v_{the}$
- Two ion fronts with speed of  $\sim C_s$

- Underlying physics

- Between electron fronts:  $q_{\parallel e} \sim n_e T_e v_{the}$
- Between ion fronts:  $q_{\parallel e} \sim n_e T_e V_{\parallel e} = n_e T_e V_{\parallel i}$  subject to the ambipolar transport
- Cooling front, acted as a shock, isolate the core plasma from wall temperature  $T_w$ : the ambipolar transport between the ion fronts determines the ultimate cooling history of center  $T_{\parallel e}$  till  $T_w$

- The kinetic instability and wave-particle interaction leads to temperature isotropization that cools down perpendicular electron temperature

